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Epitome

(57) [Abstract]
[Technical problem] Evasion of the crushing remainder in the front end part of the side member at the time of a front collision is aimed at.
[Means for Solution] If a car carries out a front collision, since the high rigidity section 9 which combined the first cross member's 6 subframe 11 will have offset to the cross direction inside rather than the bond part with a side member 1, while this high rigidity section 9 is crushed and does not remain on the axis of a side member 1, and being on extension of a side member 1 and carrying out buckling distortion of the crash box 7 in the first cross member's 6 closed section by the deformation process of an easily transformable part 13, the buckling distortion of the shaft orientations of a side member 1 can be made to perform stably.

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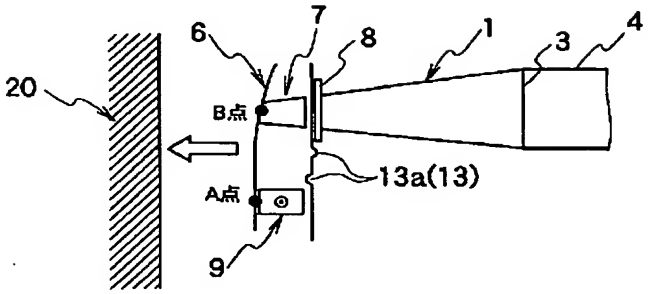

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CLAIMS

[Claim(s)]
[Claim 1] The side member of the closed section structure which is arranged in the cross direction both-sides section of a front compartment, and extends in a car-body cross direction The first cross member of the closed section structure which is combined ranging over the front end of the side member of these right and left, and extends in the cross direction While being the car-body anterior part structure of the automobile equipped with the above and arranging a energy-absorbing member on abbreviation extension of said side-member front end in said first cross member's closed section The high rigidity section which combines other Body Manufacturing Division articles with the location offset to the cross direction inside rather than the bond part with said side-member front end of this first cross member is set up. And a bond part with this first cross member's side-member front end, It is characterized by preparing an easily transformable part between said high rigidity sections.
[Claim 2] Car-body anterior part structure of the automobile according to claim 1 characterized by infixing a high rigidity plate in the bond part of the side-member front end and a first cross member.
[Claim 3] Car-body anterior part structure of an automobile given in claims 1 and 2 characterized by making an energy absorption member lower in buckling strength than a side member.
[Claim 4] Car-body anterior part structure of an automobile given in any of claims 1-3 characterized by forming a first cross member's high rigidity section in a low wall on this first cross member they are.
[Claim 5] Car-body anterior part structure of an automobile given in any of claims 1-4 characterized by having offset the wall surface location ahead of a bond part with the side member of a first cross-member front wall back, and setting it up rather than the wall surface location of the part which set up the high rigidity section they are.
[Claim 6] Car-body anterior part structure of an automobile given in any of claims 1-4 characterized by setting up smaller than the closed section order width of face of the part which set up the high rigidity section the closed section order width of face of the part which combined a first cross member's side-member front end they are.
[Claim 7] Car-body anterior part structure of an automobile given in any of claims 1-6 characterized by joining an after [a side member] flank to strut housing only in two or more bracket sections formed selectively they are.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the car-body anterior part structure of an

automobile.
[0002]
[Description of the Prior Art] in the car-body anterior part structure of an automobile, it is shown at JP,2000-16327,A -- as -- a suspension link -- and -- or what combined with the front end section underside of a side member the front end section of the subframe which supports the lower part of a power unit is known.
[0003]
[Problem(s) to be Solved by the Invention] Although it is the main energy-absorbing members which a side member is formed in a closed section as everyone knows, is arranged in the cross direction both-sides section of a front compartment by the cross direction, crushes and deforms into a cross direction at the time of the front collision of a car, and absorb collision energy The high rigidity section is formed in the front end section of this side member by having combined the front end section of a subframe with that front end section as mentioned above. This sake, At the time of axial crushing of a side member, this high rigidity section is crushed, it becomes the remainder, and sufficient energy-absorbing and load distribution are no longer performed in this part.
[0004] Then, this invention offers the car-body anterior part structure of the automobile which can collapse into the front end part of a side member, cannot produce the remainder, can be made to be able to perform axial crushing good, and can raise energy-absorbing effectiveness.
[0005]
[Means for Solving the Problem] The side member of the closed section structure which is arranged in the cross direction both-sides section of a front compartment, and extends in a car-body cross direction if it is in invention of claim 1, In the car-body anterior part structure of the automobile equipped with the first cross member of the closed section structure which is combined ranging over the front end of the side member of these right and left, and extends in the cross direction While arranging a energy-absorbing member on abbreviation extension of said side-member front end in said first cross member's closed section The high rigidity section which combines other Body Manufacturing Division articles with the location offset to the cross direction inside rather than the bond part with said side-member front end of this first cross member is set up. And a bond part with this first cross member's side-member front end, It is characterized by preparing an easily transformable part between said high rigidity sections.
[0006] If it is in invention of claim 2, it is the car-body anterior part structure of an automobile according to claim 1, and is characterized by infixing a high rigidity plate in the bond part of said side-member front end and first cross member.
[0007] If it is in invention of claim 3, it is the car-body anterior part structure of an automobile given in claims 1 and 2, and is characterized by making said energy absorption member lower in buckling strength than a side member.
[0008] If it is in invention of claim 4, it is the car-body anterior part structure of an automobile according to claim 1 to 3, and is characterized by forming said first cross member's high rigidity section in a low wall on this first cross member.
[0009] If it is in invention of claim 5, it is the car body structure of an automobile according to claim 1 to 4, and is characterized by having offset the wall surface location ahead of a bond part with the side member of said first cross-member front wall back, and setting it up rather than the wall surface location of the part which set up the high rigidity section.
[0010] If it is in invention of claim 6, it is the car-body anterior part structure of an automobile according to claim 1 to 4, and is characterized by setting up smaller than the closed section order width of face of the part which set up the high rigidity section the closed section order width of face of the part which combined said first cross member's side-member front end.
[0011] If it is in invention of claim 7, it is the car-body anterior part structure of an automobile according to claim 1 to 6, and is characterized by joining to strut housing only in two or more bracket sections which formed the after [said side member] flank selectively.
[0012]
[Effect of the Invention] If a car carries out a front collision according to invention according to claim 1, the load transfer to a side member will be efficiently performed from the energy

absorption member in the first cross-member closed section arranged on abbreviation extension of the side-member front end, and crushing reaction force will occur. Although said energy-absorbing member carries out crushing deformation (buckling distortion) according to this crushing reaction force Under the present circumstances, since a bond part with a first cross member's side-member front end and the easily transformable part prepared between the high rigidity sections of the cross direction inside rather than it deform, While the buckling distortion of said energy-absorbing member is not influenced of this high rigidity section and buckling distortion of the shaft orientations of this energy-absorbing member is performed smoothly A side member carries out buckling distortion to shaft orientations following the buckling distortion of the shaft orientations of this energy absorption member, and energy absorption is performed by the buckling distortion of each shaft orientations of these energy absorption member and a side member.

[0013] And as mentioned above, since a first cross member's high rigidity section exists in the cross direction inside rather than the axis of a side member, on the axis of a side member, this high rigidity section can be crushed, and cannot remain, and it can expand the crushing stroke of a side member.

[0014] Consequently, the amount of energy-absorbing can be conjointly raised with the energy-absorbing effectiveness by said energy-absorbing member.

[0015] Since it is prevented according to invention according to claim 2 that the buckling distortion of a energy-absorbing member is stopped by existence of the high rigidity plate infixed in the bond part of a first cross member and the side-member front end on a high rigidity plate in addition to the effect of the invention of claim 1, and a buckling distortion operation of this energy-absorbing member affects the front end section of a side member, buckling distortion of the side member can be carried out to shaft orientations by crushing Mohd stabilized from the front end section.

[0016] According to invention according to claim 3, to the effect of the invention of claims 1 and 2 In addition, since, as for the energy absorption member, buckling strength is low set up rather than the side member, While buckling distortion is performed in good order from a load operation from an energy absorption member to a side member and being able to carry out buckling distortion of the energy absorption member certainly Buckling distortion of the side member can be carried out by crushing Mohd stabilized more from the front end side, and efficient energy-absorbing can be made to perform.

[0017] According to invention according to claim 4, in addition to the effect of the invention of claims 1-3, a first cross member's high rigidity section is prepared in the low wall on this first cross member, and deformation of the first cross-member posterior wall of stomach which combined the side-member front end by the easily transformable part cannot be influenced of this high rigidity section, therefore the buckling distortion of the shaft orientations of a energy-absorbing member can be made to perform more appropriately.

[0018] Since the part which set up a first cross member's high rigidity section at the time of the front collision of a car contacts [according to invention according to claim 5] a collision object beyond the part on front extension of a side-member bond part in addition to the effect of the invention of claims 1-4, force by deformation can be made to be able to act on an easily transformable part promptly, it can be made to be able to deform, and the buckling distortion of the shaft orientations of a energy-absorbing member can be made to perform more stably.

[0019] According to invention according to claim 6, it adds to the effect of the invention of claims 1-4. When the part where a first cross member's front face set up the high rigidity section, and the part on front extension of a side-member bond part contact simultaneously to a collision object at the time of the front collision of a car Force by deformation can be made to be able to act on an easily transformable part promptly, it can be made to be able to deform, and the buckling distortion of the shaft orientations of a energy-absorbing member can be made to perform more stably.

[0020] Since according to invention according to claim 7 an after [a side member] flank can be joined only in two or more bracket sections to strut housing and a junction KE place can be held down to necessary minimum, the adverse effect to deformation Mohd by an after [a side

member] flank serving as high rigidity by junction in strut housing can be lessened, buckling distortion of the side member can be carried out by crushing Mohd stabilized even from the front end to the after flank, and the energy-absorbing effectiveness can be heightened.
[0021]
[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained in full detail with a drawing.
[0022] In drawing 1 and 2, 1 shows the side member which is arranged in the cross direction both-sides section of front compartment F-C, and extends in a car-body cross direction.
[0023] This side member 1 accomplishes the main energy-absorbing members at the time of the front collision of front compartment F-C, and it has made them the shape of a taper used as path size as it results [from the front end] in the back end, while comparing outer panel 1a and inner panel 1b which are in this operation gestalt and were formed in the shape of L character, carrying out flange junction and having formed in the closed section of four square shapes.
[0024] Moreover, each corner of four square shapes is covered at a cross direction, two or more beads 2 are formed in the front end section of this side member 1, and it enables it to have carried out induction of the buckling distortion of the shaft orientations at the time of the front collision of a car to it.
[0025] Junction connection of the extension member 4 has been carried out through the connection plate 3 at these side-members 1 order section, and junction immobilization of this extension member 4 has been carried out by surroundings **** from the front face of a dash panel 5 on the underside.
[0026] Moreover, the side members 1 and 1 on either side are combined by the first cross member 6 who extends in the cross direction in those front end.
[0027] This first cross member 6 compares front panel 6a and rear panel 6b which were formed in the shape of L character, does flange junction, and is formed in the closed section of four square shapes.
[0028] In the first cross member's 6 closed section, the energy-absorbing member 7 is arranged on abbreviation extension of the front end of said side member 1.
[0029] With this operation gestalt, this energy absorption member 7 is formed as a crash box of a truncated 4-sided pyramid with the metal plate, and this crash box 7 is placed neatly on the abbreviation axis of a side member 1, and it has fixed before the first cross member 6 ranging over the posterior wall of stomach.
[0030] This crash box 7 has set up the buckling strength of that cross direction low rather than the side member 1.
[0031] Moreover, although it compares to the first cross member's 6 posterior wall of stomach and junction immobilization is carried out, the front end of a side member 1 carries out junction arrangement of the high rigidity plate 8 which becomes the front end of this side member 1 from a rigid high metallic material rather than these side members 1 and the first cross member 6 beforehand, and a closed section is blockaded, and through this high rigidity plate 8, the polymerization of it is carried out to the first cross member's 6 posterior wall of stomach, and it has carried out junction immobilization.
[0032] On the other hand, the high rigidity section 9 is formed in the location offset to the first cross member 6 at the cross direction inside rather than the bond part with said side-member 1 front end. Conclusion immobilization of the front end section of the subframe 11 as other Body Manufacturing Division articles is carried out with the bolt nut 12 at the first cross member's 6 low wall side at this high rigidity section 9. Conclusion immobilization of the back end section of this subframe 11 has been carried out with the bolt nut 12 as well as the extension member 4 of said side member 1.
[0033] Moreover, between a bond part with said side-member 1 front end, and said high rigidity section 9, bead 13a of two or more lengthwise directions is prepared in a posterior wall of stomach, and the easily transformable part 13 is formed in the first cross member 6.
[0034] Said high rigidity section 9 is constituted in the shape of a block so that the conclusion rigidity of the bolt nut 12 which fixes the front end section of a subframe 11 can be secured, but in order to form an easily transformable part 13 in the first cross member's 6 posterior wall of

stomach as mentioned above, as for this high rigidity section 9, it is desirable on the first cross member 6 to prepare covering a low wall and to make it not affect the deformation process of the easily transformable part 13 by this high rigidity section 9 at a posterior wall of stomach.
[0035] Moreover, if it is in this operation gestalt, at the first cross member's 6 right-and-left both-sides edge, a front wall is turned back, bow shaping is carried out, and the wall surface location ahead of [with the side member 1 of the first cross member's 6 front wall] a bond part is offset more back than the wall surface location of the part which set up the high rigidity section 9.
[0036] On the other hand, although joined throughout the abbreviation for the soffit of the strut housing 14 through a flange, if an after [a side member 1] flank is in this operation gestalt, as shown in drawing 3 , it protrudes the bracket section 15 of order plurality on an after [this side member 1] flank, and has usually carried out junction immobilization only in the part of this bracket section 15 at the strut housing 14.
[0037] If according to the structure of the above operation gestalt a car carries out a front collision at the collision object 20 as shown in drawing 4 -7 Although the load transfer to the shaft orientations of a side member 1 is efficiently performed from the crash box 7 in the closed section of the first cross member 6 who arranged on abbreviation extension of the side-member 1 front end, crushing reaction force occurs and said crash box 7 carries out buckling distortion to shaft orientations according to this crushing reaction force Under the present circumstances, in order that bead 13a of the lengthwise direction which constitutes a bond part with the side-member 1 front end of the first cross member's 6 posterior wall of stomach and the easily transformable part 13 prepared between the high rigidity sections 9 of the cross direction inside rather than it may carry out elongation deformation at the cross direction, The buckling distortion of said crash box 7 is not influenced of this high rigidity section 9, and buckling distortion of the shaft orientations of this crash box 7 is performed smoothly.
[0038] A side member 1 deforms into shaft orientations following the buckling distortion of the shaft orientations of this crash box 7, and energy-absorbing is performed by the buckling distortion of each shaft orientations of these crash box 7 and a side member 1.
[0039] And as mentioned above, since the first cross member's 6 high rigidity section exists in the cross direction inside rather than the axis of a side member 1, on the axis of a side member 1, this high rigidity section 9 can be crushed, and cannot remain, and it can expand the crushing stroke of a side member 1.
[0040] And the subframe 11 combined with the high rigidity section 9 as shown in drawing 8 with progress of crushing deformation of the front end section of a side member 1 carries out bending deformation according to impacting vehicle force F.
[0041] Consequently, an energy absorbed amount can be conjointly raised with buildup of energy absorption with said crash box 7, and a crushing stroke of a side member 1.
[0042] Here the A point of the part which set up the high rigidity section 9 of the first cross member's 6 front face on the occasion of a front collision as shown in drawing 5 with said collision object 20 In order to contact the collision object 20 ahead of the B point of the part on front extension of a bond part with a side member 1, The moment M occurs in said bead 13a, since force by deformation can be made to be able to act on this bead 13a promptly and it can be made to deform into it, it can be stabilized and the buckling distortion of the shaft orientations of said crash box 7 can be made to perform, as shown in drawing 6 .
[0043] If the high rigidity section 9 is especially formed in a low wall on the first cross member 6 as mentioned above, since the deformation of this bead 13a prepared in the posterior wall of stomach will not be influenced [rigid] of this high rigidity section 9, deformation of this bead 13a is performed smoothly, and the buckling distortion of the shaft orientations of said crash box 7 can be made to perform more stably.
[0044] On the other hand, since buckling strength is low set up rather than the side member 1, as shown in drawing 6 and 7, buckling distortion is performed in good order from a load operation from the crash box 7 to a side member 1, and said crash box 7 can carry out buckling distortion of the crash box 7 certainly.
[0045] Since the high rigidity plate 8 is infixed in the bond part of the front end a side member's

1, and the first cross member's 6 posterior wall of stomach at this time, The buckling distortion of this crash box 7 is stopped on this high rigidity plate 8. It is prevented that a buckling distortion operation of this crash box 7 affects the front end section of a side member 1. Consequently, shaft orientations can be made to be able to carry out buckling distortion of the side member 1 to buckling distortion being performed in good order from the crash box 7 conjointly by crushing Mohd stabilized from the front end, and efficient energy-absorbing can be made to perform.

[0046] And when the buckling distortion of the shaft orientations of a side member 1 advances to an after flank, Since an after [this side member 1] flank is joined only in two or more bracket sections 15 to the strut housing 14 which is one of the frame members of front compartment F-C and the junction KE place is held down to necessary minimum, The adverse effect to deformation Mohd by an after [a side member 1] flank serving as high rigidity by junction in this strut housing 14 can be lessened, buckling distortion of this side member 1 can be carried out by crushing Mohd stabilized even from the front end to the after flank, and the energy-absorbing effectiveness can be heightened.

[0047] Although bead 13a of a lengthwise direction constitutes the first cross member's 6 easily transformable part 13 from said operation gestalt, you may make it constitute as a fragile site which prepared the notch etc. so that it might fracture to the cross direction by the necessary tension load like the 2nd operation gestalt shown in drawing 9 .

[0048] It is the closed section order width of face L2 of the part which formed the first cross member's 6 front wall in the cross direction in the shape of a straight line, and combined the side-member 1 front end if drawing 10 shows the 3rd operation gestalt of this invention and was in this operation gestalt. Closed section order width of face L1 of the part which set up the high rigidity section 9 It has set up small (L2 <L1).

[0049] Therefore, in the case of this 3rd operation gestalt, if a front collision is carried out with the collision object 20, the A point of the part which set up the high rigidity section 9 of the first cross member's 6 front face, and the B point of the part on front extension of a bond part with a side member 1 will come to contact simultaneously to the collision section 20, but Said closed section order width of face L1 and L2 By difference, an easily transformable part 13 can be made to be able to generate the bending deformation moment promptly, this easily transformable part 13 can be made to be able to deform, and the same effectiveness as said 1st operation gestalt can be acquired.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The decomposition perspective view showing the 1st operation gestalt of this invention.

[Drawing 2] The side elevation showing the assembly condition of the 1st operation gestalt of this invention.

[Drawing 3] The side elevation showing a junction condition with strut housing in the 1st operation gestalt of this invention.
[Drawing 4] The cross-section explanatory view which meets the A-A line of drawing 2 explaining the operation at the time of the front collision of the 1st operation gestalt of this invention.
[Drawing 5] The same cross-section explanatory view as drawing 4 explaining the operation at the time of the front collision of the 1st operation gestalt of this invention.
[Drawing 6] The same cross-section explanatory view as drawing 4 explaining the operation at the time of the front collision of the 1st operation gestalt of this invention.
[Drawing 7] The same cross-section explanatory view as drawing 4 explaining the operation at the time of the front collision of the 1st operation gestalt of this invention.
[Drawing 8] The side-face explanatory view showing the deformation condition of a side member and a subframe at the time of the front collision of the 1st operation gestalt of this invention.
[Drawing 9] The same cross-section explanatory view as drawing 5 which shows the 2nd operation gestalt of this invention.
[Drawing 10] The same cross-section explanatory view as drawing 4 which shows the 3rd operation gestalt of this invention.
[Description of Notations]
F-C Front compartment
1 Side Member
6 First Cross Member
7 Crash Box (Energy-absorbing Member)
8 High Rigidity Plate
9 High Rigidity Section
11 Subframe (Other Body Manufacturing Division Articles)
13 Easily Transformable Part
14 Strut Housing
15 Bracket Section

[Translation done.]

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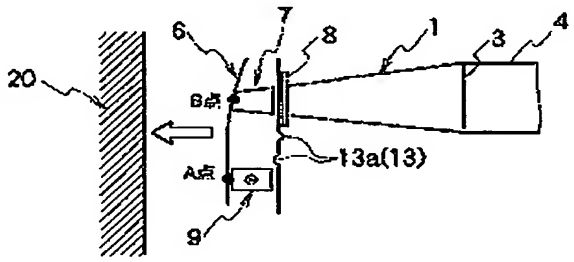
Ｆターム(参考)　3D003 AA01 AA05 BB01 CA02 CA09 DA14

(54)【発明の名称】　自動車の車体前部構造

(57)【要約】
【課題】　前面衝突時におけるサイドメンバの前端部分での潰れ残りの回避を図る。
【解決手段】　車両が前面衝突すると、ファーストクロスメンバ６のサブフレーム１１を結合した高剛性部９がサイドメンバ１との結合部よりも車幅方向内側にオフセットしているため、該高剛性部９がサイドメンバ１の軸線上で潰れ残ることがなく、易変形部１３の変形作用によりファーストクロスメンバ６の閉断面内のクラッシュボックス７をサイドメンバ１の延長上で座屈変形させると共に、サイドメンバ１の軸方向の座屈変形を安定的に行わせることができる。



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【特許請求の範囲】

【請求項１】　フロントコンパートメントの車幅方向両側部に配設されて車体前後方向に延在する閉断面構造のサイドメンバと、これら左右のサイドメンバの前端に跨って結合されて車幅方向に延在する閉断面構造のファーストクロスメンバとを備えた自動車の車体前部構造において、

前記ファーストクロスメンバの閉断面内に、前記サイドメンバ前端の略延長上にエネルギー吸収部材を配設すると共に、

該ファーストクロスメンバの前記サイドメンバ前端との結合部よりも車幅方向内側にオフセットした位置に他の車体部品を結合する高剛性部を設定し、

かつ、該ファーストクロスメンバのサイドメンバ前端との結合部と、前記高剛性部との間に易変形部を設けたことを特徴とする自動車の車体前部構造。

【請求項２】　サイドメンバ前端とファーストクロスメンバとの結合部に、高剛性プレートを介装したことを特徴とする請求項１に記載の自動車の車体前部構造。

【請求項３】　エネルギー吸収部材をサイドメンバよりも座屈強度を低くしたことを特徴とする請求項１、２に記載の自動車の車体前部構造。

【請求項４】　ファーストクロスメンバの高剛性部を、該ファーストクロスメンバの上、下壁に形成したことを特徴とする請求項１～３の何れかに記載の自動車の車体前部構造。

【請求項５】　ファーストクロスメンバ前壁のサイドメンバとの結合部の前方の壁面位置を、高剛性部を設定した部分の壁面位置よりも後方にオフセットして設定したことを特徴とする請求項１～４の何れかに記載の自動車の車体前部構造。

【請求項６】　ファーストクロスメンバのサイドメンバ前端を結合した部位の閉断面前後幅を、高剛性部を設定した部位の閉断面前後幅よりも小さく設定したことを特徴とする請求項１～４の何れかに記載の自動車の車体前部構造。

【請求項７】　サイドメンバの後側部を、部分的に形成した複数のブラケット部でのみストラットハウジングに接合したことを特徴とする請求項１～６の何れかに記載の自動車の車体前部構造。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は自動車の車体前部構造に関する。

【０００２】

【従来の技術】自動車の車体前部構造の中には、例えば特開２０００－１６３２７号公報に示されているように、サスペンションリンクおよび又はパワーユニットの下部を支持するサブフレームの前端部を、サイドメンバの前端部下面に結合したものが知られている。

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【０００３】

【発明が解決しようとする課題】サイドメンバは周知のように閉断面に形成され、フロントコンパートメントの車幅方向両側部に前後方向に配設されて、車両の前面衝突時には前後方向に潰れ変形して衝突エネルギーを吸収する主要なエネルギー吸収部材であるが、前述のようにその前端部にサブフレームの前端部を結合してあることによって、該サイドメンバの前端部に高剛性部が形成され、このため、サイドメンバの軸圧潰時に該高剛性部が潰れ残りとなってこの部分で十分なエネルギー吸収や荷重分散が行われなくなる可能性がある。

【０００４】そこで、本発明はサイドメンバの前端部分に潰れ残りを生じることがなく軸圧潰を良好に行わせてエネルギー吸収効率を高めることができる自動車の車体前部構造を提供するものである。

【０００５】

【課題を解決するための手段】請求項１の発明にあっては、フロントコンパートメントの車幅方向両側部に配設されて車体前後方向に延在する閉断面構造のサイドメンバと、これら左右のサイドメンバの前端に跨って結合されて車幅方向に延在する閉断面構造のファーストクロスメンバとを備えた自動車の車体前部構造において、前記ファーストクロスメンバの閉断面内に、前記サイドメンバ前端の略延長上にエネルギー吸収部材を配設すると共に、該ファーストクロスメンバの前記サイドメンバ前端との結合部よりも車幅方向内側にオフセットした位置に他の車体部品を結合する高剛性部を設定し、かつ、該ファーストクロスメンバのサイドメンバ前端との結合部と、前記高剛性部との間に易変形部を設けたことを特徴としている。

【０００６】請求項２の発明にあっては、請求項１に記載の自動車の車体前部構造であって、前記サイドメンバ前端とファーストクロスメンバとの結合部に、高剛性プレートを介装したことを特徴としている。

【０００７】請求項３の発明にあっては、請求項１，２に記載の自動車の車体前部構造であって、前記エネルギー吸収部材をサイドメンバよりも座屈強度を低くしたことを特徴としている。

【０００８】請求項４の発明にあっては、請求項１～３に記載の自動車の車体前部構造であって、前記ファーストクロスメンバの高剛性部を、該ファーストクロスメンバの上、下壁に形成したことを特徴としている。

【０００９】請求項５の発明にあっては、請求項１～４に記載の自動車の車体構造であって、前記ファーストクロスメンバ前壁のサイドメンバとの結合部の前方の壁面位置を、高剛性部を設定した部分の壁面位置よりも後方にオフセットして設定したことを特徴としている。

【００１０】請求項６の発明にあっては、請求項１～４に記載の自動車の車体前部構造であって、前記ファーストクロスメンバのサイドメンバ前端を結合した部位の閉

断面前後幅を、高剛性部を設定した部位の閉断面前後幅よりも小さく設定したことを特徴としている。

【００１１】請求項７の発明にあっては、請求項１～６に記載の自動車の車体前部構造であって、前記サイドメンバの後側部を、部分的に形成した複数のブラケット部でのみストラットハウジングに接合したことを特徴としている。

【００１２】

【発明の効果】請求項１に記載の発明によれば、車両が前面衝突すると、サイドメンバ前端の略延長上に配設したファーストクロスメンバ閉断面内のエネルギー吸収部材から効率的にサイドメンバへの荷重伝達が行われて圧潰反力が発生し、この圧潰反力により前記エネルギー吸収部材が圧潰変形（座屈変形）するが、この際、ファーストクロスメンバのサイドメンバ前端との結合部と、それよりも車幅方向内側の高剛性部との間に設けた易変形部が変形するため、前記エネルギー吸収部材の座屈変形がこの高剛性部の影響を受けることがなく、該エネルギー吸収部材の軸方向の座屈変形がスムーズに行われると共に、このエネルギー吸収部材の軸方向の座屈変形に続いてサイドメンバが軸方向に座屈変形し、これらエネルギー吸収部材とサイドメンバの各軸方向の座屈変形によりエネルギー吸収が行われる。

【００１３】しかも、前述のようにファーストクロスメンバの高剛性部はサイドメンバの軸線よりも車幅方向内側に存在しているため、該高剛性部がサイドメンバの軸線上で潰れ残ることがなく、サイドメンバの潰れストロークを拡大することができる。

【００１４】この結果、前記エネルギー吸収部材によるエネルギー吸収効果と相俟ってエネルギー吸収量を高めることができる。

【００１５】請求項２に記載の発明によれば、請求項１の発明の効果に加えて、ファーストクロスメンバとサイドメンバ前端との結合部に介装した高剛性プレートの存在により、エネルギー吸収部材の座屈変形が高剛性プレートで留められて該エネルギー吸収部材の座屈変形作用がサイドメンバの前端部に波及するのが阻止されるため、サイドメンバを前端部から安定した潰れモードで軸方向に座屈変形させることができる。

【００１６】請求項３に記載の発明によれば、請求項１、２の発明の効果に加えて、エネルギー吸収部材はサイドメンバよりも座屈強度が低く設定されているため、エネルギー吸収部材からサイドメンバへと座屈変形が荷重作用方向から順序よく行われ、エネルギー吸収部材を確実に座屈変形させることができると共に、サイドメンバを前端側からより安定した潰れモードで座屈変形させることができて、効率的なエネルギー吸収を行わせることができる。

【００１７】請求項４に記載の発明によれば、請求項１～３の発明の効果に加えて、ファーストクロスメンバの高剛性部を該ファーストクロスメンバの上、下壁に設けてあって、易変形部によるサイドメンバ前端を結合したファーストクロスメンバ後壁の変形が該高剛性部の影響を受けることがなく、従って、エネルギー吸収部材の軸方向の座屈変形をより適切に行わせることができる。

【００１８】請求項５に記載の発明によれば、請求項１～４の発明の効果に加えて、車両の前面衝突時にファーストクロスメンバの高剛性部を設定した部位がサイドメンバ結合部の前方延長上の部位よりも先に衝突物と接触するため、易変形部に直ちに変形荷重を作用させて変形させることができ、エネルギー吸収部材の軸方向の座屈変形をより安定的に行わせることができる。

【００１９】請求項６に記載の発明によれば、請求項１～４の発明の効果に加えて、車両の前面衝突時にファーストクロスメンバの前面が、高剛性部を設定した部位とサイドメンバ結合部の前方延長上の部位とが衝突物に対して同時に接触した場合に、易変形部に直ちに変形荷重を作用させて変形させることができ、エネルギー吸収部材の軸方向の座屈変形をより安定的に行わせることができる。

【００２０】請求項７に記載の発明によれば、サイドメンバの後側部をストラットハウジングに対して複数のブラケット部でのみ接合して、接合ヶ所を必要最小限に抑えることができるため、ストラットハウジングとの接合によりサイドメンバ後側部が高剛性となることによる変形モードへの悪影響を少なくできて、サイドメンバを前端から後側部にまで安定した潰れモードで座屈変形させてエネルギー吸収効果を高めることができる。

【００２１】

【発明の実施の形態】以下、本発明の実施形態を図面と共に詳述する。

【００２２】図１，２において、１はフロントコンパートメントＦ・Ｃの車幅方向両側部に配設されて車体前後方向に延在するサイドメンバを示す。

【００２３】このサイドメンバ１はフロントコンパートメントＦ・Ｃの前面衝突時における主要なエネルギー吸収部材を成すもので、本実施形態にあってＬ字状に形成したアウタパネル１ａとインナパネル１ｂとを突き合わせてフランジ接合して４角形の閉断面に形成してあると共に、前端から後端に至るにしたがって径大となるテーパ状としてある。

【００２４】また、このサイドメンバ１の前端部には、４角形の各角部に前後方向に亘って複数のビード２を設けて、車両の前面衝突時における軸方向の座屈変形を誘起し得るようにしてある。

【００２５】これらサイドメンバ１の前後部には接続プレート３を介してエクステンションメンバ４を接合連結してあり、該エクステンションメンバ４をダッシュパネル５の前面から下面に廻り込んで接合固定してある。

【００２６】また、左右のサイドメンバ１，１はそれら

の前端において車幅方向に延在するファーストクロスメンバ６で結合してある。

【００２７】このファーストクロスメンバ６はＬ字状に形成したフロントパネル６ａとリヤパネル６ｂとを突き合わせてフランジ接合して４角形の閉断面に形成してある。

【００２８】ファーストクロスメンバ６の閉断面内には、前記サイドメンバ１の前端の略延長上にエネルギー吸収部材７を配設してある。

【００２９】本実施形態ではこのエネルギー吸収部材７を金属プレートにより截頭４角錐のクラッシュボックスとして形成してあり、該クラッシュボックス７をサイドメンバ１の略軸線上に揃えてファーストクロスメンバ６の前、後壁に跨って固設してある。

【００３０】このクラッシュボックス７はサイドメンバ１よりもその前後方向の座屈強度を低く設定してある。

【００３１】また、サイドメンバ１の前端はファーストクロスメンバ６の後壁に突き合わせて接合固定されるが、該サイドメンバ１の前端にはこれらサイドメンバ１、ファーストクロスメンバ６よりも剛性の高い金属材料からなる高剛性プレート８を予め接合配置して閉断面を閉塞してあり、該高剛性プレート８を介してファーストクロスメンバ６の後壁に重合して接合固定してある。

【００３２】一方、ファーストクロスメンバ６には、前記サイドメンバ１前端との結合部よりも車幅方向内側にオフセットした位置に高剛性部９を設けてあり、ファーストクロスメンバ６の下壁側において該高剛性部９に他の車体部品としてのサブフレーム１１の前端部をボルト・ナット１２により締結固定し、該サブフレーム１１の後端部を前記サイドメンバ１のエクステンションメンバ４に同じくボルト・ナット１２により締結固定してある。

【００３３】また、ファーストクロスメンバ６には、前記サイドメンバ１前端との結合部と、前記高剛性部９との間に、後壁に複数の縦方向のビード１３ａを設けて易変形部１３を形成してある。

【００３４】前記高剛性部９はサブフレーム１１の前端部を固定するボルト・ナット１２の締結剛性を確保し得るようにブロック状に構成されるが、前述のようにファーストクロスメンバ６の後壁には易変形部１３を形成するため、該高剛性部９はファーストクロスメンバ６の上、下壁に亘って設けて後壁にはこの高剛性部９による易変形部１３の変形作用に影響を及ぼさないようにすることが望ましい。

【００３５】また、本実施形態にあってはファーストクロスメンバ６の左右両側端部で前壁を後方に向けて湾曲成形して、ファーストクロスメンバ６の前壁のサイドメンバ１との結合部前方の壁面位置が、高剛性部９を設定した部分の壁面位置よりも後方にオフセットするようにしてある。

【００３６】他方、サイドメンバ１の後側部は、通常、フランジを介してストラットハウジング１４の下端の略全域で接合されるが、本実施形態にあっては該サイドメンバ１の後側部に図３に示すように前後複数のブラケット部１５を突設して、該ブラケット部１５の部分でのみストラットハウジング１４に接合固定してある。

【００３７】以上の実施形態の構造によれば、図４～７に示すように車両が衝突物２０に前面衝突すると、サイドメンバ１前端の略延長上に配設したファーストクロスメンバ６の閉断面内のクラッシュボックス７から効率的にサイドメンバ１の軸方向への荷重伝達が行われて圧潰反力が発生し、この圧潰反力により前記クラッシュボックス７が軸方向に座屈変形するが、この際、ファーストクロスメンバ６の後壁のサイドメンバ１前端との結合部と、それよりも車幅方向内側の高剛性部９との間に設けた易変形部１３を構成する縦方向のビード１３ａが車幅方向に伸び変形するため、前記クラッシュボックス７の座屈変形がこの高剛性部９の影響を受けることがなく、該クラッシュボックス７の軸方向の座屈変形がスムーズに行われる。

【００３８】このクラッシュボックス７の軸方向の座屈変形に続いてサイドメンバ１が軸方向に変形し、これらクラッシュボックス７とサイドメンバ１の各軸方向の座屈変形によってエネルギー吸収が行われる。

【００３９】しかも、前述のようにファーストクロスメンバ６の高剛性部はサイドメンバ１の軸線よりも車幅方向内側に存在しているため、該高剛性部９がサイドメンバ１の軸線上で潰れ残ることがなく、サイドメンバ１の潰れストロークを拡大することができる。

【００４０】そして、サイドメンバ１の前端部の潰れ変形の進行と共に、図８に示すように高剛性部９に結合したサブフレーム１１が衝突荷重Ｆによって曲げ変形する。

【００４１】この結果、前記クラッシュボックス７によるエネルギー吸収作用、およびサイドメンバ１の潰れストロークの増大と相俟ってエネルギー吸収量を高めることができる。

【００４２】ここで、前記衝突物２０との前面衝突の際に、図５に示すようにファーストクロスメンバ６の前面の高剛性部９を設定した部位のＡ点が、サイドメンバ１との結合部の前方延長上の部位のＢ点よりも先に衝突物２０と接触するため、前記ビード１３ａにはモーメントＭが発生して該ビード１３ａに直ちに変形荷重を作用させて変形させることができるため、図６に示すように前記クラッシュボックス７の軸方向の座屈変形を安定して行わせることができる。

【００４３】特に、前述のように高剛性部９をファーストクロスメンバ６の上、下壁に設けるようにすれば、後壁に設けたこのビード１３ａの変形が該高剛性部９の剛性影響を受けないため、該ビード１３ａの変形がスムー

ズに行われて前記クラッシュボックス７の軸方向の座屈変形をより安定的に行わせることができる。

【００４４】一方、前記クラッシュボックス７はサイドメンバ１よりも座屈強度が低く設定されているため、図６、７に示すようにクラッシュボックス７からサイドメンバ１へと座屈変形が荷重作用方向から順序よく行われ、クラッシュボックス７を確実に座屈変形させることができる。

【００４５】この時、サイドメンバ１の前端とファーストクロスメンバ６の後壁との結合部には高剛性プレート８を介装してあるため、このクラッシュボックス７の座屈変形が該高剛性プレート８で留められて、該クラッシュボックス７の座屈変形作用がサイドメンバ１の前端部に波及するのが阻止され、この結果、座屈変形がクラッシュボックス７から順序よく行われることと相俟って、サイドメンバ１を前端から安定した潰れモードで軸方向に座屈変形させることができて効率的なエネルギー吸収を行わせることができる。

【００４６】そして、サイドメンバ１の軸方向の座屈変形が後側部へ進行した場合、このサイドメンバ１の後側部はフロントコンパートメントＦ・Ｃの骨格メンバの１つであるストラットハウジング１４に対して複数のブラケット部１５でのみ接合して、接合ケ所を必要最小限に抑えてあるため、該ストラットハウジング１４との接合によりサイドメンバ１の後側部が高剛性となることによる変形モードへの悪影響を少なくできて、該サイドメンバ１を前端から後側部にまで安定した潰れモードで座屈変形させてエネルギー吸収効果を高めることができる。

【００４７】前記実施形態ではファーストクロスメンバ６の易変形部１３を縦方向のビード１３ａで構成しているが、図９に示す第２実施形態のように所要の引張荷重で車幅方向に破断するようにノッチ等を設けた脆弱部として構成するようにしてもよい。

【００４８】図１０は本発明の第３実施形態を示すもので、本実施形態にあってはファーストクロスメンバ６の前壁は車幅方向に直線状に形成して、サイドメンバ１前端を結合した部位の閉断面前後幅L_2を、高剛性部９を設定した部位の閉断面前後幅L_1よりも小さく設定（$L_2 < L_1$）してある。

【００４９】従って、この第３実施形態の場合、衝突物＊２０と前面衝突するとファーストクロスメンバ６の前面の高剛性部９を設定した部位のＡ点と、サイドメンバ１との結合部の前方延長上の部位のＢ点とが衝突部２０に対して同時に接触するようになるが、前記閉断面前後幅L_1、L_2の差分によって易変形部１３に直ちに曲げ変形モーメントを発生させて該易変形部１３を変形させ、前記第１実施形態と同様の効果を得ることができる。

【図面の簡単な説明】

【図１】本発明の第１実施形態を示す分解斜視図。

【図２】本発明の第１実施形態の組立状態を示す側面図。

【図３】本発明の第１実施形態におけるストラットハウジングとの接合状態を示す側面図。

【図４】本発明の第１実施形態の前面衝突時の作用を説明する図２のＡ－Ａ線に沿う断面説明図。

【図５】本発明の第１実施形態の前面衝突時の作用を説明する図４と同様の断面説明図。

【図６】本発明の第１実施形態の前面衝突時の作用を説明する図４と同様の断面説明図。

【図７】本発明の第１実施形態の前面衝突時の作用を説明する図４と同様の断面説明図。

【図８】本発明の第１実施形態の前面衝突時におけるサイドメンバとサブフレームの変形状態を示す側面説明図。

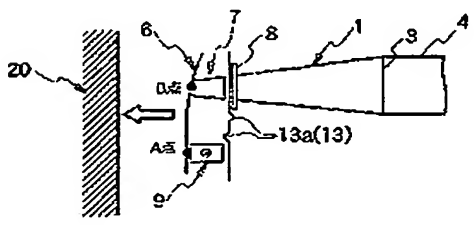
【図９】本発明の第２実施形態を示す図５と同様の断面説明図。

【図１０】本発明の第３実施形態を示す図４と同様の断面説明図。

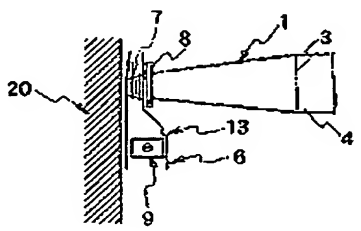
【符号の説明】

Ｆ・Ｃ　フロントコンパートメント
１　サイドメンバ
６　ファーストクロスメンバ
７　クラッシュボックス（エネルギー吸収部材）
８　高剛性プレート
９　高剛性部
１１　サブフレーム（他の車体部品）
１３　易変形部
１４　ストラットハウジング
１５　ブラケット部

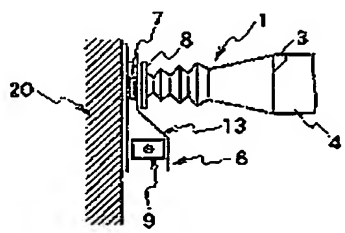
【図４】



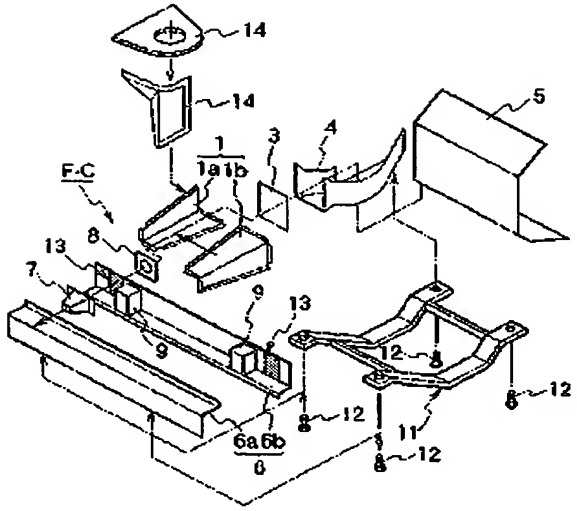
【図６】



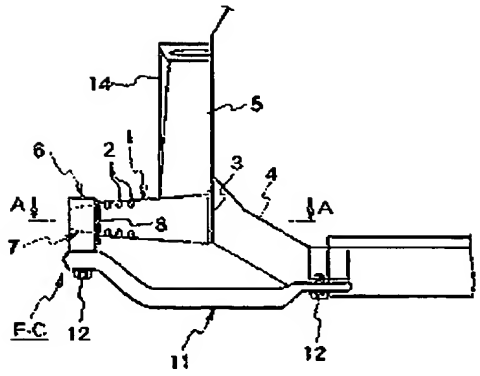
【図７】



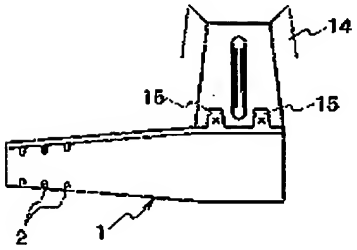
【図１】



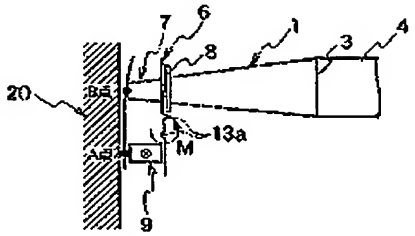
【図２】



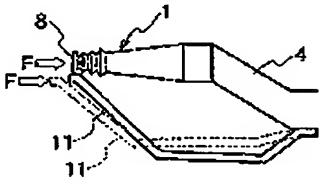
【図３】



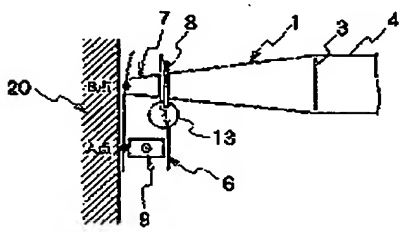
【図５】



【図８】



【図９】



【図１０】